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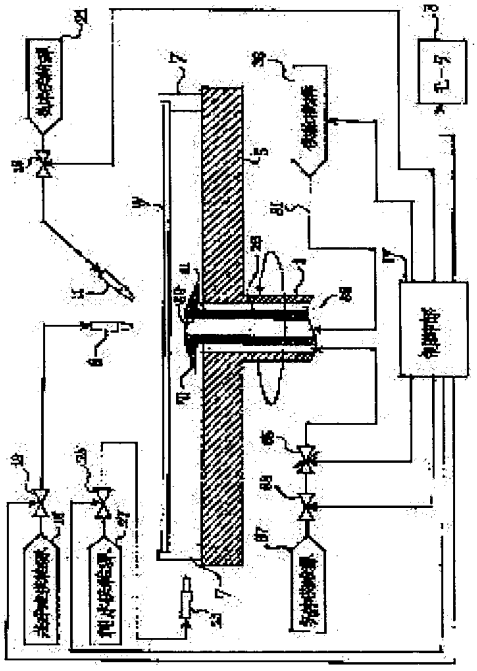
(54) SUBSTRATE TREATMENT APPARATUS

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent the contamination of the back of a substrate without performing the drying treatment of the substrate in a contaminated atmosphere of a chemical soln. contained in a washing soln.
SOLUTION: A motor 3 for rotating the spin base 5 having the surface opposed to the under surface of a wafer W to support the wafer W when the wafer W is supported in such a state that the under surface of the wafer W is allowed to be spaced apart from the opposed surface, a lower washing nozzle 29 for supplying a washing soln. to the under surface of the wafer W supported on the spin base 5, a side part washing nozzle 23 for supplying pure water different from the washing soln. to the space between the opposed surface of the spin base 5 and the under surface of the wafer W supported on the spin base 5 from the lateral side of the spin base 5 after the supply of the washing soln. to the under surface of the wafer W by the lower washing nozzle 29 are provided to a substrate treatment apparatus. Therefore, the opposed surface of the spin base 5 can be washed and the contamination of the under surface of the substrate W can be prevented without performing drying treatment in a contaminated atmosphere of the chemical soln. contained in the washing soln.



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CLAIMS

[Claim(s)]
[Claim 1] The substrate support means which is the substrate processor which performs predetermined processing to a substrate, and supports a substrate in the condition of having the inferior surface of tongue of a substrate, and the opposed face which counters, and having made the inferior surface of tongue and said opposed face of a substrate estranging, The driving means which rotates said substrate support means which supported the substrate, and a 1st processing liquid supply means to supply the 1st processing liquid to the inferior surface of tongue of the substrate supported by said substrate support means, After supplying [of the 1st processing liquid] the inferior surface of tongue of the substrate by said 1st processing liquid supply means, between the opposed face of said substrate support means, and the inferior surface of tongue of the substrate supported by said substrate support means The substrate processor characterized by having a 2nd processing liquid supply means to supply the 2nd processing liquid which is different from the 1st processing liquid from the side of said substrate support means.
[Claim 2] The 2nd processing liquid which the 1st processing liquid which is a substrate processor according to claim 1, and is supplied by said 1st processing liquid supply means is a penetrant remover containing a drug solution, and is supplied by said 2nd processing liquid supply means is a substrate processor characterized by being pure water.
[Claim 3] The substrate support means which is the substrate processor which performs predetermined processing to a substrate, and supports a substrate in the condition of having the inferior surface of tongue of a substrate, and the opposed face which counters, and having made the inferior surface of tongue and said opposed face of a substrate estranging, While supplying the 1st processing liquid to the inferior surface of tongue of the substrate supported by the driving means which rotates said substrate support means which supported the substrate, and said substrate support means A 1st processing liquid supply means to supply the different 2nd processing liquid from the 1st processing liquid after supply of the 1st processing liquid, After supplying [of the 1st processing liquid] the inferior surface of tongue of the substrate by said 1st processing liquid supply means, between the opposed face of said substrate support means, and the inferior surface of tongue of the substrate supported by said substrate support means The substrate processor characterized by having a 2nd processing liquid supply means to supply the 3rd processing liquid which is different from the 1st processing liquid from the side of said substrate support means.
[Claim 4] The 3rd processing liquid supplied by the 2nd processing liquid which the 1st processing liquid which is a substrate processor according to claim 3, and is supplied by said 1st processing liquid supply means is a penetrant remover containing a drug solution, and is supplied by said 1st processing liquid supply means, and said 2nd processing liquid supply means is a substrate processor characterized by being pure water.
[Claim 5] Where said substrate support means which is a substrate processor according to claim 4, and supported the substrate by said driving means is rotated After processing from said 1st processing liquid supply means by supplying the penetrant remover of the specified quantity to the inferior surface of tongue of a substrate, In the condition of having made it smaller than the

time of supply of the penetrant remover according either to said 1st processing liquid supply means at least of the rotational speed of said substrate support means, and the flow rate of the penetrant remover by said 1st processing liquid supply means The substrate processor characterized by having further the control means which makes pure water supply to the inferior surface of tongue of a substrate from said 1st processing liquid supply means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the substrate processor which supplies the processing liquid which contains a drug solution in substrates, such as substrates for photo masks, such as a semi-conductor wafer and a glass substrate for liquid crystal, such as a penetrant remover and pure water, and performs predetermined processing of washing processing etc.
[0002]
[Description of the Prior Art] There is a substrate processor equipped with the spin base which supports a wafer where the inferior surface of tongue of a wafer is estranged, and the nozzle which supplies processing liquid, such as a drug solution and pure water, by the predetermined flow rate towards the inferior surface of tongue of a wafer from the center section of this spin base as this kind of a substrate processor conventionally, contacting the periphery section of the wafer which is a kind of a substrate. By making processing liquid supply to the inferior-surface-of-tongue core of a wafer by the fixed large flow rate from a nozzle, carrying out high-speed rotation of the spin base by a motor etc. in this substrate processor, where a substrate is supported Open the processing liquid supplied to the inferior-surface-of-tongue core of a wafer to the periphery side of a substrate with a centrifugal force, the whole inferior surface of tongue of a wafer is made to cover with processing liquid, dirt, such as particle adhering to the inferior surface of tongue of a wafer, is removed, and washing processing of the inferior surface of tongue of a wafer is performed.
[0003]
[Problem(s) to be Solved by the Invention] However, in the conventional substrate processor mentioned above, in case the flow rate of the processing liquid supplied to the inferior surface of tongue of a wafer displaces greatly like [the time of starting supply of processing liquid, for example from a nozzle, and at the time of stopping supply of the processing liquid from a nozzle], the condition that the processing liquid from a nozzle is not temporarily supplied appropriately towards the inferior surface of tongue of a wafer arises. Therefore, the nozzle itself and the spin base may be polluted with the drug solution contained in processing liquid.
[0004] Thus, since desiccation processing will be performed in the contamination ambient atmosphere of a drug solution at the time of subsequent spin desiccation when the nozzle itself and the spin base continue processing in the condition of having been polluted with the drug solution, there is a problem that the inferior surface of tongue of the wafer once washed with the processing liquid containing a drug solution will be polluted.
[0005] This invention is made in view of such a situation, and aims at offering the substrate processor which can prevent that do not perform desiccation processing into the contamination ambient atmosphere of a drug solution, and the inferior surface of tongue of substrates, such as a wafer, is polluted.
[0006]
[Means for Solving the Problem] In order to attain the purpose mentioned above, a substrate processor according to claim 1 The substrate support means which is the substrate processor

which performs predetermined processing to a substrate, and supports a substrate in the condition of having the inferior surface of tongue of a substrate, and the opposed face which counters, and having made the inferior surface of tongue and said opposed face of a substrate estranging, The driving means which rotates said substrate support means which supported the substrate, and a 1st processing liquid supply means to supply the 1st processing liquid to the inferior surface of tongue of the substrate supported by said substrate support means, After supplying [of the 1st processing liquid] the inferior surface of tongue of the substrate by said 1st processing liquid supply means, between the opposed face of said substrate support means, and the inferior surface of tongue of the substrate supported by said substrate support means It is characterized by having a 2nd processing liquid supply means to supply the 2nd processing liquid which is different from the 1st processing liquid from the side of said substrate support means.

[0007] According to the substrate processor according to claim 1, the 1st processing liquid is supplied to the inferior surface of tongue of a substrate with the 1st processing liquid supply means, rotating the substrate support means to which the substrate support means supported the substrate in the condition of having made the inferior surface of tongue of a substrate, and the opposed face of a substrate support means estranging, and supported the substrate in this condition by the driving means. After supply of the 1st processing liquid, the 2nd processing liquid supply means supplies the 2nd processing liquid which is different from the 1st processing liquid from the side of a substrate support means between the opposed face of a substrate support means, and the inferior surface of tongue of the substrate supported by the substrate support means. Therefore, the 1st processing liquid which has adhered to the opposed face of a substrate support means with the 2nd processing liquid after the 1st processing liquid supply is removed.

[0008] A substrate processor according to claim 2 is a substrate processor according to claim 1, and the 1st processing liquid supplied by said 1st processing liquid supply means is a penetrant remover containing a drug solution, and it is characterized by the 2nd processing liquid supplied by said 2nd processing liquid supply means being pure water.

[0009] Since according to the substrate processor according to claim 2 pure water is supplied by the 2nd processing liquid supply means from the flank of a substrate support means after a penetrant remover is supplied to the inferior surface of tongue of a substrate by the 1st processing liquid supply means, the penetrant remover adhering to a substrate support means is removed by pure water.

[0010] The substrate support means which supports a substrate in the condition that a substrate processor according to claim 3 is a substrate processor which performs predetermined processing to a substrate, has the inferior surface of tongue of a substrate, and the opposed face which counters, and made the inferior surface of tongue and said opposed face of a substrate estrange, While supplying the 1st processing liquid to the inferior surface of tongue of the substrate supported by the driving means which rotates said substrate support means which supported the substrate, and said substrate support means A 1st processing liquid supply means to supply the different 2nd processing liquid from the 1st processing liquid after supply of the 1st processing liquid, After supplying [of the 1st processing liquid] the inferior surface of tongue of the substrate by said 1st processing liquid supply means, between the opposed face of said substrate support means, and the inferior surface of tongue of the substrate supported by said substrate support means It is characterized by having a 2nd processing liquid supply means to supply the 3rd processing liquid which is different from the 1st processing liquid from the side of said substrate support means.

[0011] According to the substrate processor according to claim 3, the 1st processing liquid is supplied to the inferior surface of tongue of a substrate with the 1st processing liquid supply means, rotating the substrate support means which supported the substrate in the condition of having made the inferior surface of tongue of a substrate, and the opposed face of a substrate support means estranging, and supported the substrate in this condition by the driving means. The 2nd processing liquid which differs from the 1st processing liquid on the inferior surface of tongue of a substrate with the 1st processing liquid supply means after supply of the 1st

processing liquid is supplied. Furthermore, the 2nd processing liquid supply means supplies the 3rd processing liquid which is different from the 1st processing liquid from the side of a substrate support means between the opposed face of a substrate support means, and the inferior surface of tongue of the substrate supported by the substrate support means. Therefore, the 1st processing liquid which has adhered to the opposed face of a substrate support means with the 3rd processing liquid supplied from the 2nd processing liquid supply means after the 1st processing liquid supply is removed.

[0012] A substrate processor according to claim 4 is a substrate processor according to claim 3, and the 1st processing liquid supplied by said 1st processing liquid supply means is a penetrant remover containing a drug solution, and it is characterized by the 3rd processing liquid supplied by the 2nd processing liquid supplied by said 1st processing liquid supply means and said 2nd processing liquid supply means being pure water.

[0013] Since according to the substrate processor according to claim 4 pure water is supplied by the 2nd processing liquid supply means from the side of a substrate support means while pure water is supplied by the 1st processing liquid supply means from the lower part of a substrate after the penetrant remover which contains a drug solution with the 1st processing liquid supply means on the inferior surface of tongue of a substrate is supplied, the drug solution adhering to the opposed face of a substrate support means is removed by pure water.

[0014] Where said substrate support means which a substrate processor according to claim 5 is a substrate processor according to claim 4, and supported the substrate by said driving means is rotated After processing from said 1st processing liquid supply means by supplying the penetrant remover of the specified quantity to the inferior surface of tongue of a substrate, In the condition of having made it smaller than the time of supply of the penetrant remover according either to said 1st processing liquid supply means at least of the rotational speed of said substrate support means, and the flow rate of the penetrant remover by said 1st processing liquid supply means It is characterized by having further the control means which makes pure water supply to the inferior surface of tongue of a substrate from said 1st processing liquid supply means.

[0015] According to the substrate processor according to claim 5, where the substrate support means which supported the substrate by the driving means first is rotated, the 1st processing liquid supply means supplies the penetrant remover of the specified quantity to the inferior surface of tongue of a substrate. Then, the 1st processing liquid supply means supplies pure water to the inferior surface of tongue of a substrate in the condition of having made it smaller than the time of supply of the penetrant remover according either to the 1st processing liquid supply means at least of the rotational speed of a substrate support means, and the flow rate of the penetrant remover by the 1st processing liquid supply means. If rotational speed of a substrate support means is made small, even if the pure water supplied from the 1st processing liquid supply means arrives at the inferior surface of tongue of a substrate, it will descend to the opposed face of a substrate support means in a core, and will flow into the perimeter of a substrate support means. Moreover, if the flow rate of a penetrant remover is made small, upwards, pure water will not be supplied from the 1st processing liquid supply means, but it will descend to the opposed face of a substrate support means, and will flow into the perimeter of a substrate support means.

[0016]

[Embodiment of the Invention] Hereafter, one example of this invention is explained with reference to a drawing. Drawing 1 is drawing of longitudinal section showing the outline configuration of the substrate washing station which is a kind of the substrate processor concerning this invention, and drawing 2 is the block diagram showing the outline configuration of a feeder style shown in drawing 1 .

[0017] The revolving shaft 1 in the air is connected with the revolving shaft of a motor 3, and is pivotable to the circumference of a vertical axis by the drive of this motor 3. The disc-like spin base 5 is connected with the upper limit section of this revolving shaft 1 in one. Two or more support pins 7 which support Wafer W are formed near the periphery section of the spin base 5, contacting the periphery edge of the wafer W which is a kind of a substrate. By two or more

support pins 7, Wafer W is in the condition isolated from the inferior surface of tongue of Wafer W, and the opposed face of the spin base 5 which counters between predetermined, and is supported horizontally.

[0018] In order to wash the top face of Wafer W above the spin base 5, it has the up washing nozzle 9 which supplies penetrant removers, such as pure water and a drug solution, towards near the center of rotation of the top face of Wafer W, and the up gas nozzle 11 which supplies gases, such as inert gas, such as nitrogen gas, and a dried air, to Wafer W. Besides, free passage connection of the section washing nozzle 9 is made through the closing motion valve 13 at the penetrant remover source of supply 15, and a penetrant remover is supplied to the top face of Wafer W by closing motion control of the closing motion valve 13 by the control section 17 from the up washing nozzle 9. Moreover, after continuation connection is made and the up gas nozzle 11 performs washing processing by the up washing nozzle 9 to the gas source of supply 21 through the closing motion valve 19, by closing motion control of the closing motion valve 19 by the control section 17, it supplies a gas to the top face of Wafer W from the up gas nozzle 11, and performs desiccation processing of Wafer W.

[0019] The side of the spin base 5 is equipped with the flank washing nozzle 23 which supplies pure water between the top face of the spin base 5, and the inferior surface of tongue of Wafer W. Free passage connection is made through the closing motion valve 25 at the pure-water source of supply 27, pure water passes through the space between the opposed face of the spin base 5, and the inferior surface of tongue of Wafer W from the flank washing nozzle 23, and this flank washing nozzle 23 is supplied to the opposed face of the spin base 5 by closing motion control of the closing motion valve 25 by the control section 17.

[0020] The lower penetrant remover nozzle 29 is formed in the centrum of the rotation section 1 at the same axle. Free passage connection of the feeder style 33 later mentioned through piping 31 is made at this lower penetrant remover nozzle 29.

[0021] The cylinder-like gas supply way 59 is formed in the space between the inner skin of a revolving shaft 1, and the lower washing nozzle 29, the point of this gas supply way 59 functions as a gas exhaust nozzle 61, and gases, such as nitrogen gas, are supplied to the space between the inferior surface of tongue of Wafer W, and the opposed face of the spin base 5 from the gas exhaust nozzle 61. Free passage connection of the gas exhaust nozzle 61 is made at the gas source of supply 67 through the closing motion valve 63 and flow control valve 65 in which closing motion control is carried out by the control section 17.

[0022] The umbrella type cutoff member 71 is attached in the upper limit section of the lower washing nozzle 29. This cutoff member 71 is formed in a configuration which covers the upper part of the gas exhaust nozzle 61, and the top face inclines so that it may descend towards the periphery section from the jet section 69. Although the illustration abbreviation is carried out, the gas which blew off from the gas exhaust nozzle 61 is directly supplied towards the inferior surface of tongue of Wafer W also from the stoma of a large number currently formed in the cutoff member 71, while it is supplied to the space between the inferior surface of tongue of Wafer W, and the opposed face of the spin base 5 from the clearance between the inferior surface of tongue of the cutoff member 71, and the opposed face of the spin base 5.

[0023] Next, the feeder style 33 is explained with reference to drawing 2 . Drawing 2 is the block diagram showing the outline configuration of a feeder style. Free passage connection of the 1st pure-water source of supply 35 for supplying pure water to the end side of piping 31 is made, and, on the other hand, free passage connection of the lower washing nozzle 29 (refer to drawing 1) is made at the other end side. In order to adjust the flow rate of the pure water from the 1st pure-water source of supply 35, the pressure regulator 37 is formed in this piping 31. Moreover, the flowmeter 39 which measures the flow rate of the pure water from the 1st pure-water source of supply 35 is formed in the piping 31 of the downstream of this pressure regulator 37. A control section 17 asks for the difference of the flow rate measured with this flowmeter 39, and the flow rate (the 1st flow rate FV1) set up beforehand, and an electro pneumatic converter 41 adjusts the pneumatic pressure to a pressure controller 37 based on the command electrical potential difference based on this difference.

[0024] The chemical-feeding section 43 is formed in the piping 31 of the lower stream of a river

of a flowmeter 39. This chemical-feeding section 43 is equipped with three flow control valves 45, 47, and 49 equipped with the function of a closing motion valve and a flow control valve, and the closing motion valve 51 prepared in the piping 31 of the downstream of a flowmeter 39 in order to enable it to adjust respectively the injection rate of each fluid to piping 31 independently.

[0025] The 1st drug solution source of supply 53 is open for free passage, and the 1st flow control valve 45 adjusts the injection rate of the 1st drug solution to piping 31, and the 2nd flow control valve 47 is opened for free passage by the 2nd drug solution source of supply 55, and it adjusts the injection rate of the 2nd drug solution to piping 31. Moreover, the 2nd pure-water source of supply 57 is open for free passage, and the 3rd flow control valve 57 adjusts the injection rate of the pure water to piping 31.

[0026] In addition, all of closing motion control of the closing motion valve 51 and flow control valves 45, 47, and 49 are controlled by the control section 17 in generalization. Moreover, flow control valves 45, 47, and 49 are beforehand set up so that it may become a predetermined flow rate, and especially the flow rate adjusted by the 3rd flow control valve 49 is adjusted so that it may become the 2nd flow rate FV2 smaller than the 1st flow rate FV1 beforehand set up by the pressure controller 37.

[0027] In case washing processing of the inferior surface of tongue of Wafer W is carried out, a control section 17 opens the closing motion valve 51 wide. While it is adjusted so that it may become the 1st flow rate FV1 with a pressure controller 37 through an electro pneumatic converter 41, and supplying the pure water from the 1st pure-water source of supply 35 to piping 31 It is adjusted so that it may become the 2nd flow rate FV2 smaller than the 1st flow rate FV1 by the 3rd flow control valve 49, and the pure water from the 2nd pure-water source of supply 57 is poured in to piping 31. Moreover, flow control valves 45 and 47 are adjusted and the 1st or/and the 2nd drug solution of requirements are poured in to piping 31. Therefore, the penetrant remover with which the necessary drug solution was mixed only for requirements by the pure water of a large flow rate with which the 1st flow rate FV1 and 2nd flow rate FV2 were doubled is supplied to the inferior surface of tongue of Wafer W.

[0028] Moreover, in case the jet section 69 and the covered member 71 of the lower washing nozzle 29 to which the penetrant remover adhered are washed, the closing motion valve 51 and flow control valves 45 and 47 are stopped, and it is adjusted so that it may become the 2nd flow rate FV2 of a small flow rate from the 1st flow rate FV1 by the flow control valve 49, and only pure water is poured in from the 2nd pure-water source of supply 57 to piping 31. At this time, by opening the closing motion valve 25 shown in drawing 1 , pure water passes through the space between the opposed face of the spin base 5, and the inferior surface of tongue of Wafer W from the flank washing nozzle 23, and a control section 17 is supplied to the opposed face of the spin base 5.

[0029] Next, actuation of a substrate processor is explained, referring to the flow chart of drawing 3 . In addition, it omits about the explanation of operation with the up washing nozzle 9 and the up gas nozzle 11 which are prepared above Wafer W.

[0030] First, a control section 17 carries out the roll control of the motor 3, and carries out high-speed rotation of the wafer W at the 1st rotational frequency (step S1). The rotational frequency at this time is for example, 600rpm extent. With rotation initiation at the 1st rotational frequency of Wafer W, a control section 17 While supplying the pure water adjusted so that the closing motion valve 51 might be opened wide and it might become the 1st flow rate FV1 (a part for for example, 2.4l./) with a pressure controller 37 through an electro pneumatic converter 41 to piping 31 from the 1st pure-water source of supply 35 The pure water adjusted so that it might become the 2nd flow rate FV2 (a part for for example, 0.5l./) by the flow control valve 49 is poured in from the 2nd pure-water source of supply 57 to piping 31. Furthermore, the drug solution of the specified quantity is poured in to piping 31 through flow control valves 45 and 47 from the 1st drug solution source of supply 53 and the 2nd drug solution source of supply 55. The penetrant remover with which the drug solution was mixed by the pure water of a large flow rate (a part for 2.9l./[This example]) with which the 1st flow rate FV1 and 2nd flow rate FV2 were doubled is supplied to the inferior surface of tongue of Wafer W from the exhaust nozzle 69

of the lower washing nozzle 29, and the inferior surface of tongue of Wafer W is washed by the penetrant remover. (Step S2)

[0031] Therefore, with rotation of the wafer W in the 1st rotational frequency, a penetrant remover moves toward the periphery section from the inferior surface of tongue of the core of Wafer W, and it disperses around while a penetrant remover makes the penetrant remover supplied by the large flow rate supply with sufficient vigor to the inferior surface of tongue of Wafer W from the jet section 69. In addition, the drop containing the particle adhering to the droplet of the penetrant remover which contains a drug solution at this time, and the inferior surface of tongue of Wafer W adheres to the cutoff member 71 of the lower washing nozzle 29, or the opposed face of the spin base 5.

[0032] Next, a control section 17 stops the condition and flow control valves 45 and 47 holding the 1st rotational frequency in step S1 mentioned above, and suspends the impregnation to the piping 31 of a drug solution. Therefore, since only pure water is supplied to the inferior surface of tongue of Wafer W from the lower washing nozzle 29 by the large flow rate (a part for 2.9l./) at Wafer W, washing by the pure water to the inferior surface of tongue of Wafer W which was touching the penetrant remover is performed (step S3). In addition, at this time, it continues being in the condition in which the drop of a penetrant remover adhered to the cutoff member 71 of the lower washing nozzle 29, or the opposed face of the spin base 5.

[0033] A control section 17 carries out the roll control of the motor 3, and rotates Wafer W rather than the 1st rotational frequency at the 2nd rotational frequency which is a low speed (step S4). The rotational frequency at this time is for example, 20rpm extent. A control section 17 opens the closing motion valve 25 wide, and starts supply of pure water from the pure-water source of supply 27 through the flank washing nozzle 23 with rotation initiation of the 2nd rotational frequency of Wafer W to the space between the inferior surface of tongue of Wafer W, and the opposed face of the spin base 5. Moreover, while stopping a shut-off valve 51, a flow control valve 49 is considered as as [the condition of having opened wide]. Consequently, the pure water adjusted so that it might become a small flow rate (a part for 0.5l./) by the flow control valve 49 is poured in from the 2nd pure-water source of supply 57 to piping 31, and it is supplied from the lower washing nozzle 29. Therefore, it flows down to the covered member 71 of the lower washing nozzle 29, without going upwards, pure water moves toward the periphery section with rotation of the wafer W in the 2nd rotational frequency from the inferior surface of tongue of Wafer W, and the pure water supplied by the small flow rate disperses around. At this time, the drop of the penetrant remover adhering to the exhaust nozzle 69 and the covered member 71 of the lower washing nozzle 29 is removed (step S5).

[0034] A control section 17 carries out the roll control of the motor 3, and rotates Wafer W rather than the 2nd rotational frequency at the 3rd rotational frequency which is a low speed further (step S6). The rotational frequency at this time is for example, 10rpm extent. a control section 17 carries out the closedown of the flow control valve 49 -- while taking, the closing motion valve 51 is opened wide and control of a pressure controller 37 is resumed. Thereby, from the lower washing nozzle 29, the pure water of the 1st flow rate FV1 (a part for 2.4l./) is supplied. Therefore, although the pure water supplied from the exhaust nozzle 69 of the lower washing nozzle 29 goes to the inferior surface of tongue of Wafer W, with rotation of the wafer W in the 3rd rotational frequency, somewhat, pure water falls from the center of rotation of Wafer W, to the opposed face of the spin base 5 toward the periphery section, when it spreads to some extent, breadth and, and flows down toward the periphery section. Thereby, the drop of the penetrant remover adhering to the opposed face of the spin base 5 is removed (step S7).

[0035] Next, a control section 17 rotates Wafer W at the 1st rotational frequency (600rpm) again (step S8). And a control section 17 opens a flow control valve 49 wide, and pure water is supplied to the inferior surface of tongue of the wafer W by which high-speed rotation is carried out by the large flow rate (a part for 2.9l./) from the lower washing nozzle 29. Therefore, the inferior surface of tongue of Wafer W is again washed by pure water like SUTTEPU S3 mentioned above (step S9).

[0036] Next, a control section 17 stops the closing motion valve 51, and suspends supply of the pure water from the lower washing nozzle 29 while it stops a flow control valve 49. Moreover, a

control section 17 carries out the blade latch also of the closing motion valve 25, and also suspends supply of pure water between the inferior surface of tongue of the wafer W from the flank washing nozzle 23, and the opposed face of the spin base 5. On the other hand, while opening the closing motion valve 63 shown in drawing 1 , it passes along the gas supply way 59 from the gas source of supply 67, and the inert gas adjusted to the proper flow rate by the flow control valve 65 is supplied towards the inferior surface of tongue of Wafer W from the gas exhaust nozzle 61. And rotation of a motor 3 is further set as the 4th high-speed rotational frequency (for example, 3000rpm) from the 1st rotational frequency (step S10). Thereby, while Wafer W rotates at high speed, inert gas is supplied to the inferior surface of tongue of Wafer W, and desiccation processing of Wafer W is performed (step S11).

[0037] After desiccation processing of this step S11 is completed, a control section 17 also suspends rotation of Wafer W with a drive halt of a motor 3 (step S12). In this, actuation of single string washing processing and desiccation processing stops.

[0038] As mentioned above, in case the inferior surface of tongue of Wafer W is washed In case a penetrant remover is supplied by the maximum flow rate and the lower washing nozzle 29 is washed While carrying out low-speed rotation of the wafer W, in case pure water is supplied by the minimum flow rate and the opposed face of the spin base 5 is washed Since pure water was supplied by the middle flow rate while carrying out low-speed rotation of the wafer W The lower washing nozzle 29 and the opposed face of the spin base 5 can be washed only by comparatively easy control of actuation / un-operating. [of a motor 3, flow control valves 45, 47, and 49 and a pressure controller 37, and the closing motion valve 51] Therefore, pure water can wash the lower washing nozzle 29 which became dirty from the penetrant remover at the time of washing of the wafer W by the penetrant remover containing a drug solution etc., and the opposed face of the spin base 5.

[0039] Moreover, since pure water is supplied from the flank washing nozzle 23 between the inferior surface of tongue of Wafer W, and the opposed face of the spin base 5 in case the lower washing nozzle 29 and the opposed face of the spin base 5 are washed, at the time of subsequent desiccation processing, it can prevent un-arranging [with which Wafer W is polluted by the adhering penetrant remover].

[0040]

[Effect of the Invention] As explained in full detail above, according to the substrate processor according to claim 1, the 2nd processing liquid supply means after supply of the 1st processing liquid between the opposed face of a substrate support means, and the inferior surface of tongue of the substrate supported by the substrate support means Since the 2nd processing liquid which is different from the 1st processing liquid from the side of a substrate support means is supplied Contamination of the inferior surface of tongue of a substrate can be prevented without being able to remove the 1st processing liquid which has adhered to the opposed face of a substrate support means with the 2nd processing liquid, and performing desiccation processing in the contamination ambient atmosphere of the 1st processing liquid after the 1st processing liquid supply.

[0041] Since pure water is supplied by the 2nd processing liquid supply means from the flank of a substrate support means after the penetrant remover which contains a drug solution with the 1st processing liquid supply means on the inferior surface of tongue of a substrate is supplied according to the substrate processor according to claim 2, the penetrant remover containing the drug solution adhering to a substrate support means can remove with pure water, and contamination of the inferior surface of tongue of a substrate can prevent, without performing desiccation processing in the contamination ambient atmosphere of the drug solution contained in a penetrant remover.

[0042] According to the substrate processor according to claim 3, the 2nd processing liquid which differs from the 1st processing liquid on the inferior surface of tongue of a substrate with the 1st processing liquid supply means after supply of the 1st processing liquid is supplied. Furthermore, since the 2nd processing liquid supply means supplies the 3rd processing liquid which is different from the 1st processing liquid from the side of a substrate support means between the opposed face of a substrate support means, and the inferior surface of tongue of

the substrate supported by the substrate support means Contamination of the inferior surface of tongue of a substrate can be prevented without being able to remove the 1st processing liquid which has adhered to the opposed face of a substrate support means with the 3rd processing liquid supplied from the 2nd processing liquid supply means, and performing desiccation processing in the contamination ambient atmosphere of the 1st processing liquid after the 1st processing liquid supply.

[0043] After the penetrant remover which contains a drug solution with the 1st processing liquid supply means on the inferior surface of tongue of a substrate is supplied, while pure water is supplied by the 1st processing liquid supply means from the lower part of a substrate according to the substrate processor according to claim 4 Since pure water is supplied by the 2nd processing liquid supply means from the side of a substrate support means, the penetrant remover containing the drug solution adhering to the opposed face of a substrate support means can remove with pure water, and contamination of the inferior surface of tongue of a substrate can be prevented, without performing desiccation processing in the contamination ambient atmosphere of the drug solution contained in a penetrant remover.

[0044] Where the substrate support means which supported the substrate by the driving means is rotated according to the substrate processor according to claim 5 After the 1st processing liquid supply means supplies the penetrant remover of the specified quantity to the inferior surface of tongue of a substrate, in the condition of having made it smaller than the time of supply of the penetrant remover according either to the 1st processing liquid supply means at least of the rotational speed of a substrate support means, and the flow rate of the penetrant remover by the 1st processing liquid supply means Since the 1st processing liquid supply means supplies pure water to the inferior surface of tongue of a substrate, it can descend to the opposed face of a substrate support means, can flow into the perimeter of a substrate support means, and pure water can wash efficiently the substrate maintenance means and the 1st processing liquid supply means which became dirty from the penetrant remover containing a drug solution. Consequently, contamination of the inferior surface of tongue of a substrate can be prevented still more effectively, without performing desiccation processing in the contamination ambient atmosphere of the drug solution contained in a penetrant remover.

[Translation done.]

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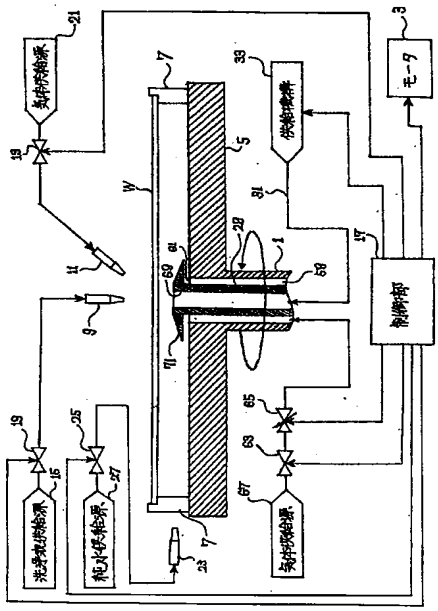
最終頁に続く

(54)【発明の名称】　基板処理装置

(57)【要約】
【課題】洗浄液に含まれる薬液の汚染雰囲気中で乾燥処理を行うことがなく、基板の下面が汚染されることを防止できる。
【解決手段】ウエハＷの下面と対向する対向面を有し、かつウエハＷの下面と対向面とを離間させた状態でウエハＷを支持すると、ウエハＷを支持したスピンベース５を回転させるモータ３と、スピンベース５に支持されたウエハＷの下面に洗浄液を供給する下部洗浄ノズル２９と、下部洗浄ノズル２９によるウエハＷの下面への洗浄液の供給後に、スピンベース５の対向面とスピンベース５に支持されたウエハＷの下面との間に、スピンベース５の側方から洗浄液とは異なる純水を供給する側部洗浄ノズル２３と、を備える。したがって、スピンベース５の対向面を洗浄でき、洗浄液に含まれる薬液の汚染雰囲気中で乾燥処理を行うことなく、基板Ｗの下面が汚染されることを防止できる

【書類名】　図面
【図１】



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【特許請求の範囲】
【請求項1】基板に所定の処理を行う基板処理装置であって、
基板の下面と対向する対向面を有し、かつ基板の下面と前記対向面とを離間させた状態で基板を支持する基板支持手段と、
基板を支持した前記基板支持手段を回転させる駆動手段と、
前記基板支持手段に支持された基板の下面に第1処理液を供給する第１処理液供給手段と、
前記第１処理液供給手段による基板の下面への第１処理液の供給後に、前記基板支持手段の対向面と前記基板支持手段に支持された基板の下面との間に、前記基板支持手段の側方から第１処理液とは異なる第２処理液を供給する第2処理液供給手段と、
を備えたことを特徴とする基板処理装置。
【請求項２】請求項１に記載の基板処理装置であって、
前記第１処理液供給手段により供給される第１処理液は薬液を含む洗浄液であり、前記第２処理液供給手段により供給される第２処理液は純水であることを特徴とする基板処理装置。
【請求項３】基板に所定の処理を行う基板処理装置であって、
基板の下面と対向する対向面を有し、かつ基板の下面と前記対向面とを離間させた状態で基板を支持する基板支持手段と、
基板を支持した前記基板支持手段を回転させる駆動手段と、
前記基板支持手段に支持された基板の下面に第1処理液を供給するとともに、第１処理液の供給後に第１処理液とは異なる第２処理液を供給する第１処理液供給手段と、
前記第１処理液供給手段による基板の下面への第１処理液の供給後に、前記基板支持手段の対向面と前記基板支持手段に支持された基板の下面との間に、前記基板支持手段の側方から第１処理液とは異なる第３処理液を供給する第2処理液供給手段と、
を備えたことを特徴とする基板処理装置。
【請求項４】請求項３に記載の基板処理装置であって、
前記第１処理液供給手段により供給される第１処理液は薬液を含む洗浄液であり、前記第１処理液供給手段により供給される第２処理液および前記第２処理液供給手段により供給される第３処理液は純水であることを特徴とする基板処理装置。
【請求項５】請求項４に記載の基板処理装置であって、
前記駆動手段により基板を支持した前記基板支持手段を回転させた状態で、前記第１処理液供給手段から所定量の洗浄液を基板の下面に供給して処理を行った後、前記基板支持手段の回転速度および前記第１処理液供給手段による洗浄液の流量の少なくともいずれか一方を前記第

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１処理液供給手段による洗浄液の供給時よりも小さくした状態で、前記第１処理液供給手段から基板の下面に純水を供給させる制御手段をさらに備えたことを特徴とする基板処理装置。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、半導体ウエハ、液晶用ガラス基板等、フォトマスク用基板等の基板に薬液を含む洗浄液、純水等の処理液を供給して洗浄処理等の所定の処理を行う基板処理装置に関する。
【０００２】
【従来の技術】従来この種の基板処理装置として、基板の一種であるウエハの周縁部に当接しつつウエハの下面を離間した状態でウエハを支持するスピンベースと、このスピンベースの中央部からウエハの下面へ向けて、薬液、純水等の処理液を所定の流量で供給するノズルとを備えた基板処理装置がある。この基板処理装置においては、基板を支持した状態でスピンベースをモータ等で高速回転させつつ、ノズルから一定の大流量で処理液をウエハの下面中心部に供給させることにより、ウエハの下面中心部に供給された処理液を遠心力で基板の外周側へ広げて、ウエハの下面全体を処理液で覆わせ、ウエハの下面に付着したパーティクル等の汚れを除去してウエハの下面の洗浄処理を行っている。
【０００３】
【発明が解決しようとする課題】しかしながら、上述した従来の基板処理装置では、例えばノズルから処理液の供給を開始した時点や、ノズルからの処理液の供給を停止させた時点のように、ウエハの下面に供給される処理液の流量が大きく変位する際には、一時的にノズルからの処理液がウエハの下面へ向けて適切に供給されない状態が生じる。そのため、ノズル自身やスピンベースが処理液に含まれる薬液等によって汚染されることがある。
【０００４】このようにノズル自身やスピンベースが薬液で汚染された状態で処理を継続してしまうと、その後のスピン乾燥時には薬液の汚染雰囲気中で乾燥処理を行うことになるため、薬液を含む処理液によって一旦洗浄されたウエハの下面が汚染されてしまうという問題がある。
【０００５】本発明は、このような事情に鑑みてなされたものであって、薬液の汚染雰囲気中に乾燥処理を行うことがなく、ウエハ等の基板の下面が汚染されることを防止できる基板処理装置を提供することを目的とする。
【０００６】
【課題を解決するための手段】上述した目的を達成するために、請求項1に記載の基板処理装置は、基板に所定の処理を行う基板処理装置であって、基板の下面と対向する対向面を有し、かつ基板の下面と前記対向面とを離間させた状態で基板を支持する基板支持手段と、基板を支持した前記基板支持手段を回転させる駆動手段と、前

記基板支持手段に支持された基板の下面に第1処理液を供給する第１処理液供給手段と、前記第１処理液供給手段による基板の下面への第１処理液の供給後に、前記基板支持手段の対向面と前記基板支持手段に支持された基板の下面との間に、前記基板支持手段の側方から第１処理液とは異なる第２処理液を供給する第2処理液供給手段と、を備えたことを特徴とするものである。

【０００７】請求項１に記載の基板処理装置によれば、基板支持手段が基板の下面と基板支持手段の対向面とを離間させた状態で基板を支持し、この状態で基板を支持した基板支持手段を駆動手段により回転させながら、第1処理液供給手段により基板の下面に第1処理液を供給する。第1処理液の供給後に、第２処理液供給手段が、基板支持手段の対向面と基板支持手段に支持された基板の下面との間に、基板支持手段の側方から第１処理液とは異なる第２処理液を供給する。したがって、第1処理液供給後に、第２処理液により基板支持手段の対向面に付着している第1処理液が除去される。

【０００８】請求項２に記載の基板処理装置は、請求項１に記載の基板処理装置であって、前記第１処理液供給手段により供給される第１処理液は薬液を含む洗浄液であり、前記第２処理液供給手段により供給される第２処理液は純水であることを特徴とするものである。

【０００９】請求項２に記載の基板処理装置によれば、第１処理液供給手段により基板の下面に洗浄液が供給された後、基板支持手段の側部から第２処理液供給手段により純水が供給されるので、基板支持手段に付着している洗浄液が純水により除去される。

【００１０】請求項３に記載の基板処理装置は、基板に所定の処理を行う基板処理装置であって、基板の下面と対向する対向面を有し、かつ基板の下面と前記対向面とを離間させた状態で基板を支持する基板支持手段と、基板を支持した前記基板支持手段を回転させる駆動手段と、前記基板支持手段に支持された基板の下面に第1処理液を供給するとともに、第１処理液の供給後に第１処理液とは異なる第２処理液を供給する第１処理液供給手段と、前記第１処理液供給手段による基板の下面への第１処理液の供給後に、前記基板支持手段の対向面と前記基板支持手段に支持された基板の下面との間に、前記基板支持手段の側方から第１処理液とは異なる第３処理液を供給する第2処理液供給手段と、を備えたことを特徴とするものである。

【００１１】請求項３に記載の基板処理装置によれば、基板の下面と基板支持手段の対向面とを離間させた状態で基板を支持し、この状態で基板を支持した基板支持手段を駆動手段により回転させながら、第1処理液供給手段により基板の下面に第1処理液を供給する。第1処理液の供給後に、第1処理液供給手段により基板の下面に第1処理液とは異なる第２処理液を供給する。さらに、第２処理液供給手段が、基板支持手段の対向面と基板支持手段に支持された基板の下面との間に、基板支持手段の側方から第１処理液とは異なる第３処理液を供給する。したがって、第1処理液供給後に、第２処理液供給手段から供給される第３処理液により基板支持手段の対向面に付着している第1処理液が除去される。

【００１２】請求項４に記載の基板処理装置は、請求項３に記載の基板処理装置であって、前記第１処理液供給手段により供給される第１処理液は薬液を含む洗浄液であり、前記第１処理液供給手段により供給される第２処理液および前記第２処理液供給手段により供給される第３処理液は純水であることを特徴とするものである。

【００１３】請求項４に記載の基板処理装置によれば、第１処理液供給手段により基板の下面に薬液を含む洗浄液が供給された後、基板の下方から第１処理液供給手段により純水が供給されるとともに、基板支持手段の側方から第２処理液供給手段により純水が供給されるので、基板支持手段の対向面に付着している薬液が純水により除去される。

【００１４】請求項５に記載の基板処理装置は、請求項４に記載の基板処理装置であって、前記駆動手段により基板を支持した前記基板支持手段を回転させた状態で、前記第１処理液供給手段から所定量の洗浄液を基板の下面に供給して処理を行った後、前記基板支持手段の回転速度および前記第１処理液供給手段による洗浄液の流量の少なくともいずれか一方を前記第１処理液供給手段による洗浄液の供給時よりも小さくした状態で、前記第１処理液供給手段から基板の下面に純水を供給させる制御手段をさらに備えたことを特徴とするものである。

【００１５】請求項５に記載の基板処理装置によれば、まず駆動手段により基板を支持した基板支持手段を回転させた状態で、第１処理液供給手段が所定量の洗浄液を基板の下面に供給する。その後、基板支持手段の回転速度および第１処理液供給手段による洗浄液の流量の少なくともいずれか一方を第１処理液供給手段による洗浄液の供給時よりも小さくした状態で、第１処理液供給手段が基板の下面に純水を供給する。基板支持手段の回転速度を小さくすると、第1処理液供給手段から供給される純水が基板の下面に達しても中心部で基板支持手段の対向面に降下して、基板支持手段の周囲に流れ出る。また、洗浄液の流量を小さくすると、第１処理液供給手段から純水は上方へは供給されず、基板支持手段の対向面に降下して、基板支持手段の周囲に流れ出る。

【００１６】

【発明の実施の形態】以下、図面を参照して本発明の一実施例を説明する。図１は、本発明に係る基板処理装置の一種である基板洗浄装置の概略構成を示す縦断面図であり、図２は、図１中に示す供給機構の概略構成を示すブロック図である。

【００１７】中空の回転軸１は、モータ３の回転軸に連結されており、このモータ３の駆動により鉛直軸周りに

回転可能である。この回転軸１の上端部には、円板状のスピンベース５が一体的に連結されている。スピンベース５の周縁部付近には、基板の一種であるウエハWの外周端部に当接しつつウエハWを支持する支持ピン７が複数本設けられている。ウエハWは、複数本の支持ピン７によって、ウエハWの下面と対向するスピンベース５の対向面から所定の間隔離した状態で、水平に支持されている。

【００１８】スピンベース５の上方には、ウエハWの上面を洗浄するためにウエハWの上面の回転中心付近に向けて純水、薬液等の洗浄液を供給する上部洗浄ノズル９と、窒素ガス等の不活性ガスやドライエア等の気体をウエハWに供給する上部ガスノズル１１とが備えられている。この上部洗浄ノズル９は、開閉弁１３を介して洗浄液供給源１５に連通接続されており、制御部１７による開閉弁１３の開閉制御によって上部洗浄ノズル９からウエハWの上面に洗浄液が供給される。また、上部ガスノズル１１は、開閉弁１９を介して気体供給源２１に連続接続されており、上部洗浄ノズル９による洗浄処理を行った後、制御部１７による開閉弁１９の開閉制御によって上部ガスノズル１１からウエハWの上面に気体を供給して、ウエハWの乾燥処理を行う。

【００１９】スピンベース５の側方には、スピンベース５の上面とウエハWの下面との間に純水を供給する側部洗浄ノズル２３が備えられている。この側部洗浄ノズル２３は、開閉弁２５を介して純水供給源２７に連通接続されており、制御部１７による開閉弁２５の開閉制御によって側部洗浄ノズル２３から純水がスピンベース５の対向面とウエハWの下面との間の空間を通過してスピンベース５の対向面へ供給される。

【００２０】回転部1の中空部には、下部洗浄液ノズル２９が同軸に設けられている。この下部洗浄液ノズル２９には、配管３１を介して後述する供給機構３３が連通接続されている。

【００２１】回転軸１の内周面と下部洗浄ノズル２９との間の空間には、円筒状の気体供給路５９が形成されており、この気体供給路５９の先端部は気体噴出口６１として機能し、気体噴出口６１からウエハWの下面とスピンベース５の対向面との間の空間に窒素ガス等の気体が供給される。気体噴出口６１は、制御部１７により開閉制御される開閉弁６３と流量調節弁６５とを介して気体供給源６７に連通接続されている。

【００２２】下部洗浄ノズル２９の上端部には、傘型の遮断部材７１が取り付けられている。この遮断部材７１は、気体噴出口６１の上方を覆うような形状に形成されており、上面は噴出部６９から周縁部に向けて下降するように傾斜している。気体噴出口６１から噴出された気体は、遮断部材７１の下面とスピンベース５の対向面との隙間から、ウエハWの下面とスピンベース５の対向面との間の空間に供給されるとともに、図示省略されているが遮断部材７１に形成されている多数の小孔からもウエハWの下面へ向けて直接供給される。

【００２３】次に、供給機構３３について図２を参照して説明する。図２は、供給機構の概略構成を示すブロック図である。配管３１の一端側には純水を供給するための第１の純水供給源３５が連通接続されており、一方、他端側には下部洗浄ノズル２９（図１参照）が連通接続されている。この配管３１には、第１の純水供給源３５からの純水の流量を調整するために圧力調整器３７が設けられている。また、この圧力調整器３７の下流側の配管３１には、第１の純水供給源３５からの純水の流量を計測する流量計３９が設けられている。この流量計３９で計測された流量と予め設定されている流量（第１の流量ＦＶ１）との差分を制御部１７が求め、この差分に基づく指令電圧に基づいて電空変換器４１が圧力調節器３７への空気圧を調整する。

【００２４】流量計３９の下流の配管３１には薬液注入部４３が設けられている。この薬液注入部４３は、配管３１への各流体の注入量を各々独立に調整することができるようにするために、開閉弁と流量調節弁との機能を備えた３つの流量調節弁４５，４７，４９と、流量計３９の下流側の配管３１に設けられた開閉弁５１とを備えている。

【００２５】第１の流量調節弁４５は、第１の薬液供給源５３に連通されており、配管３１に対する第１の薬液の注入量を調整し、第２の流量調節弁４７は、第２の薬液供給源５５に連通されており、配管３１に対する第２の薬液の注入量を調整する。また、第３の流量調節弁５７は、第２の純水供給源５７に連通されており、配管３１に対する純水の注入量を調整する。

【００２６】なお、開閉弁５１と流量調節弁４５，４７，４９の開閉制御は、すべて制御部１７によって統括的に制御される。また、流量調節弁４５，４７，４９は、所定の流量となるように予め設定されており、特に、第３の流量調節弁４９により調整される流量は、圧力調節器３７によって予め設定されている第１の流量ＦＶ１よりも少ない第２の流量ＦＶ２になるように調整されている。

【００２７】ウエハWの下面を洗浄処理する際には、制御部１７は開閉弁５１を開放し、電空変換器４１を介して圧力調節器３７により第1の流量ＦＶ１になるように調整されて第１の純水供給源３５からの純水を配管３１へ供給するとともに、第３の流量調節弁４９により第1の流量ＦＶ１よりも少ない第２の流量ＦＶ２になるように調整されて第2の純水供給源５７からの純水を配管３１へ注入する。また、流量調節弁４５，４７を調整して所要量の第１または／および第２の薬液を配管３１へ注入する。したがって、第１の流量ＦＶ１と第２の流量ＦＶ２とを合わせた大流量の純水に所要の薬液が所要量だけ混合された洗浄液がウエハWの下面へ供給される。

【００２８】また、洗浄液が付着した下部洗浄ノズル２９の噴出部６９や遮蔽部材７１を洗浄する際には、開閉弁５１、流量調節弁４５，４７を閉止し、流量調節弁４９により第１の流量ＦＶ１よりも小流量の第２の流量ＦＶ２になるように調整されて、第２の純水供給源５７から純水のみを配管３１へ注入する。このとき、制御部１７は、図１に示す開閉弁２５を開放することによって、純水が側部洗浄ノズル２３からスピンベース５の対向面とウエハWの下面との間の空間を通過してスピンベース５の対向面へ供給される。

【００２９】次に、基板処理装置の動作について、図３のフローチャートを参照しながら説明する。なお、ウエハWの上方に設けられている上部洗浄ノズル９と上部ガスノズル１１との動作説明については省略する。

【００３０】まず、制御部１７は、モータ３を回転制御してウエハWを第１の回転数で高速回転させる（ステップＳ１）。このときの回転数は、例えば、６００ｒｐｍ程度である。ウエハWの第１の回転数での回転開始とともに、制御部１７は、開閉弁５１を開放し、電空変換器４１を介して圧力調節器３７により第１の流量ＦＶ１（例えば、２．４リットル／分）となるように調整された純水を第１の純水供給源３５から配管３１へ供給するとともに、流量調節弁４９により第２の流量ＦＶ２（例えば、0．５リットル／分）となるように調整された純水を第２の純水供給源５７から配管３１へ注入する。さらに、流量調節弁４５，４７を介して所定量の薬液を第１の薬液供給源５３および第２の薬液供給源５５から配管３１へ注入し、第１の流量ＦＶ１と第２の流量ＦＶ２とを合わせた大流量（この例では、２．９リットル／分）の純水に薬液が混合された洗浄液が下部洗浄ノズル２９の噴出口６９からウエハWの下面へ供給され、ウエハWの下面が洗浄液により洗浄される。（ステップＳ２）

【００３１】したがって、大流量で供給された洗浄液は、洗浄液が勢いよく噴出部６９からウエハWの下面に供給させるとともに、第１の回転数でのウエハWの回転に伴い、洗浄液がウエハWの中心部の下面から周縁部に向かって移動して周囲に飛散する。なお、このとき薬液を含む洗浄液の飛沫や、ウエハWの下面に付着していたパーティクルを含む液滴が下部洗浄ノズル２９の遮断部材７１やスピンベース５の対向面に付着する。

【００３２】次に、制御部１７は、上述したステップＳ１での第１の回転数を保持した状態、流量調節弁４５，４７を閉止して、薬液の配管３１への注入を停止する。したがって、ウエハWには純水だけが大流量（２．９リットル／分）で下部洗浄ノズル２９からウエハWの下面に供給されるので、洗浄液に触れていたウエハWの下面への純水による洗浄が行われる（ステップＳ３）。なお、この時点では、下部洗浄ノズル２９の遮断部材７１やスピンベース５の対向面には、洗浄液の液滴が付着した状態のままである。

【００３３】制御部１７は、モータ３を回転制御してウエハWを第１の回転数よりも低速である第２の回転数で回転させる（ステップＳ４）。このときの回転数は、例えば、２０ｒｐｍ程度である。ウエハWの第２の回転数の回転開始とともに、制御部１７は、開閉弁２５を開放し、純水供給源２７から側部洗浄ノズル２３を介して、ウエハWの下面とスピンベース５の対向面との間の空間に純水の供給を開始する。また、閉止弁５１を閉止するとともに、流量調節弁４９は開放した状態のままとする。その結果、流量調節弁４９により小流量（0．５リットル／分）となるように調整された純水を第２の純水供給源５７から配管３１へ注入され、下部洗浄ノズル２９から供給される。したがって、小流量で供給される純水は、上方へ向かうことなく下部洗浄ノズル２９の遮蔽部材７１に流下し、第２の回転数でのウエハWの回転に伴い純水がウエハWの下面から周縁部に向かって移動して周囲に飛散する。このとき、下部洗浄ノズル２９の噴出口６９と遮蔽部材７１に付着している洗浄液の液滴は除去される（ステップＳ５）。

【００３４】制御部１７は、モータ３を回転制御してウエハWを第２の回転数よりもさらに低速である第３の回転数で回転させる（ステップＳ６）。このときの回転数は、例えば、１０ｒｐｍ程度である。制御部１７は、流量調節弁４９を閉止させるとともに、開閉弁５１を開放し、圧力調節器３７の制御を再開する。これにより、下部洗浄ノズル２９からは第1の流量ＦＶ１（２．４リットル／分）の純水が供給される。したがって、下部洗浄ノズル２９の噴出口６９から供給される純水はウエハWの下面へ向かうが、第３の回転数でのウエハWの回転に伴い純水がウエハWの回転中心から周縁部へ向かって多少広がり、ある程度広がった時点でスピンベース５の対向面に落下して周縁部へ向かって流下する。これにより、スピンベース５の対向面に付着していた洗浄液の液滴が除去される（ステップＳ７）。

【００３５】次に、制御部１７は、ウエハWを再び第１の回転数（６００ｒｐｍ）で回転させる（ステップＳ８）。そして、制御部１７は、流量調節弁４９を開放し、高速回転されているウエハWの下面には下部洗浄ノズル２９から純水が大流量（２．９リットル／分）で供給される。そのため、上述したスッテプＳ３と同様に、再びウエハWの下面が純水で洗浄される（ステップＳ９）。

【００３６】次に、制御部１７は、流量調節弁４９を閉止するとともに、開閉弁５１を閉止して、下部洗浄ノズル２９からの純水の供給を停止する。また、制御部１７は、開閉弁２５も開止し、側部洗浄ノズル２３からのウエハWの下面とスピンベース５の対向面との間に純水の供給も停止する。一方、図１に示す開閉弁６３を開放するとともに、流量調節弁６５により適宜の流量に調整し

た不活性ガスを気体供給源６７から気体供給路５９を通って、気体噴出口６１からウエハWの下面へ向けて供給する。そして、モータ３の回転を第１の回転数からさらに高速の第４の回転数（例えば、３０００ｒｐｍ）に設定される（ステップＳ１０）。これにより、ウエハWは高速で回転されながら、不活性ガスがウエハWの下面へ供給され、ウエハWの乾燥処理が行われる（ステップＳ１１）。

【００３７】このステップＳ１１の乾燥処理が終了した後、制御部１７は、モータ３の駆動停止に伴い、ウエハWの回転も停止する（ステップＳ１２）。これにより、一連洗浄処理及び乾燥処理の動作は停止する。

【００３８】上述したように、ウエハWの下面を洗浄する際には、洗浄液を最大の流量で供給し、下部洗浄ノズル２９を洗浄する際には、ウエハWを低速回転させるとともに最小の流量で純水を供給し、スピンベース５の対向面を洗浄する際には、ウエハWを低速回転させるとともに中間の流量で純水を供給するようにしたので、モータ３と流量調節弁４５，４７，４９、圧力調節器３７、開閉弁５１の作動／非作動といった比較的簡単な制御だけで、下部洗浄ノズル２９やスピンベース５の対向面を洗浄することができる。したがって、薬液等を含む洗浄液によるウエハWの洗浄時に洗浄液で汚れた下部洗浄ノズル２９やスピンベース５の対向面を純水で洗浄することができる。

【００３９】また、下部洗浄ノズル２９やスピンベース５の対向面を洗浄する際には、側部洗浄ノズル２３から純水をウエハWの下面とスピンベース５の対向面との間に供給しているので、その後の乾燥処理時には、付着していた洗浄液によってウエハWが汚染されるような不都合を防止できる。

【００４０】

【発明の効果】以上詳述したように、請求項１に記載の基板処理装置によれば、第1処理液の供給後に、第２処理液供給手段が、基板支持手段の対向面と基板支持手段に支持された基板の下面との間に、基板支持手段の側方から第１処理液とは異なる第２処理液を供給するので、第1処理液供給後に、第２処理液により基板支持手段の対向面に付着している第1処理液を除去でき、また第１処理液の汚染雰囲気中で乾燥処理を行うこともなく、基板の下面の汚染を防止できる。

【００４１】請求項２に記載の基板処理装置によれば、第１処理液供給手段により基板の下面に薬液を含む洗浄液が供給された後、基板支持手段の側部から第２処理液供給手段により純水が供給されるので、基板支持手段に付着している薬液を含む洗浄液が純水により除去でき、洗浄液に含まれる薬液の汚染雰囲気中で乾燥処理を行うこともなく、基板の下面の汚染を防止できる。

【００４２】請求項３に記載の基板処理装置によれば、第1処理液の供給後に、第1処理液供給手段により基板の下面に第1処理液とは異なる第２処理液を供給し、さらに、第２処理液供給手段が、基板支持手段の対向面と基板支持手段に支持された基板の下面との間に、基板支持手段の側方から第１処理液とは異なる第３処理液を供給しているので、第1処理液供給後に、第２処理液供給手段から供給される第３処理液により基板支持手段の対向面に付着している第1処理液を除去でき、また第１処理液の汚染雰囲気中で乾燥処理を行うこともなく、基板の下面の汚染を防止できる。

【００４３】請求項４に記載の基板処理装置によれば、第１処理液供給手段により基板の下面に薬液を含む洗浄液が供給された後、基板の下方から第１処理液供給手段により純水が供給されるとともに、基板支持手段の側方から第２処理液供給手段により純水が供給されるので、基板支持手段の対向面に付着している薬液を含む洗浄液が純水により除去でき、洗浄液に含まれる薬液の汚染雰囲気中で乾燥処理を行うこともなく、基板の下面の汚染を防止できる。

【００４４】請求項５に記載の基板処理装置によれば、駆動手段により基板を支持した基板支持手段を回転させた状態で、第１処理液供給手段が所定量の洗浄液を基板の下面に供給した後、基板支持手段の回転速度および第１処理液供給手段による洗浄液の流量の少なくともいずれか一方を第１処理液供給手段による洗浄液の供給時よりも小さくした状態で、第１処理液供給手段が基板の下面に純水を供給しているので、基板支持手段の対向面に降下して、基板支持手段の周囲に流れ出て、薬液を含む洗浄液で汚れた基板保持手段や第1処理液供給手段を純水で効率的に洗浄することができる。その結果、洗浄液に含まれる薬液の汚染雰囲気中で乾燥処理を行うこともなく、基板の下面の汚染をさらに効果的に防止できる。

【図面の簡単な説明】

【図１】本発明に係る基板処理装置の概略構成を示す縦断面図である。

【図２】供給機構の概略構成を示す図である。

【図３】本発明に係る基板処理装置の動作を示すフローチャートである。

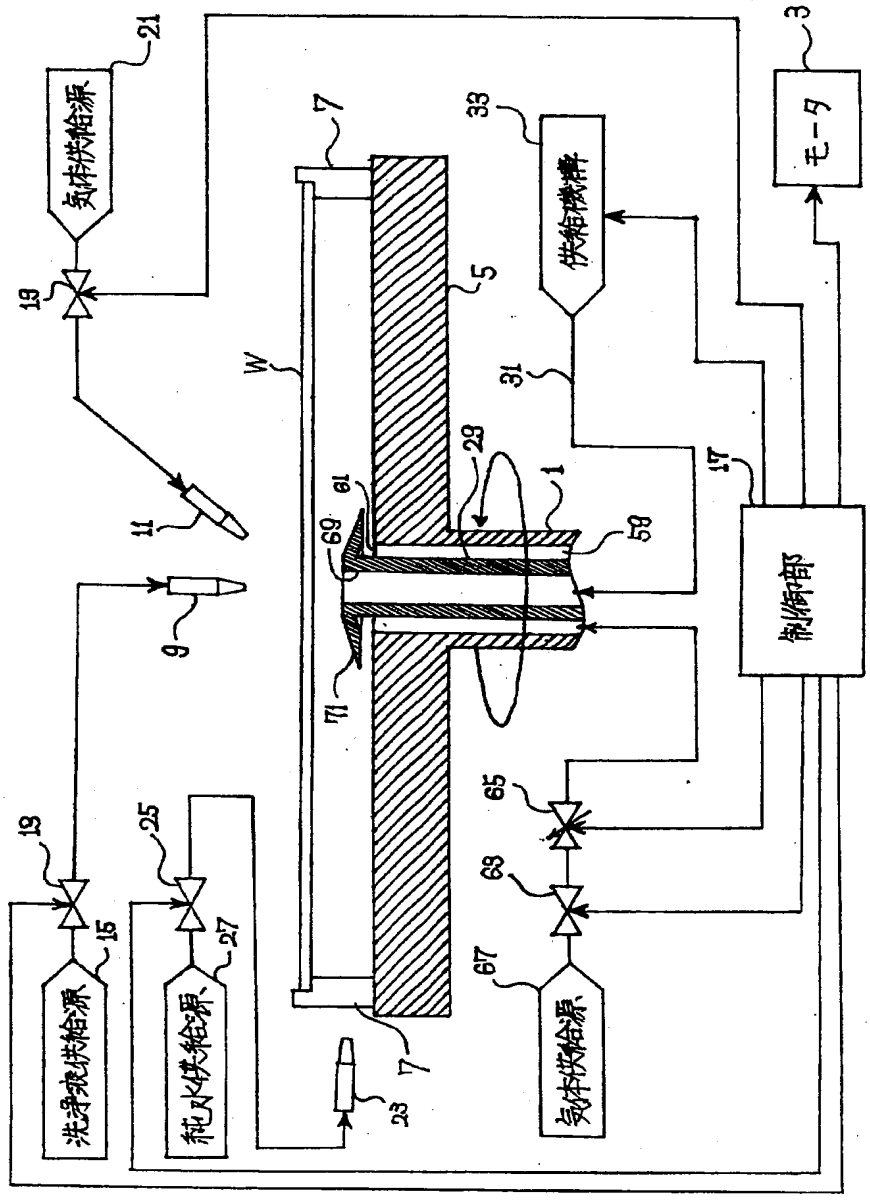
【符号の説明】

Ｗ　…　ウエハ
１　…　回転軸
３　…　モータ
５　…　スピンベース
７　…　支持ピン
１７　…　制御部
２３　…　側部洗浄ノズル
２９　…　下部洗浄ノズル
３３　…　供給機構

【図１】

【書類名】　図面

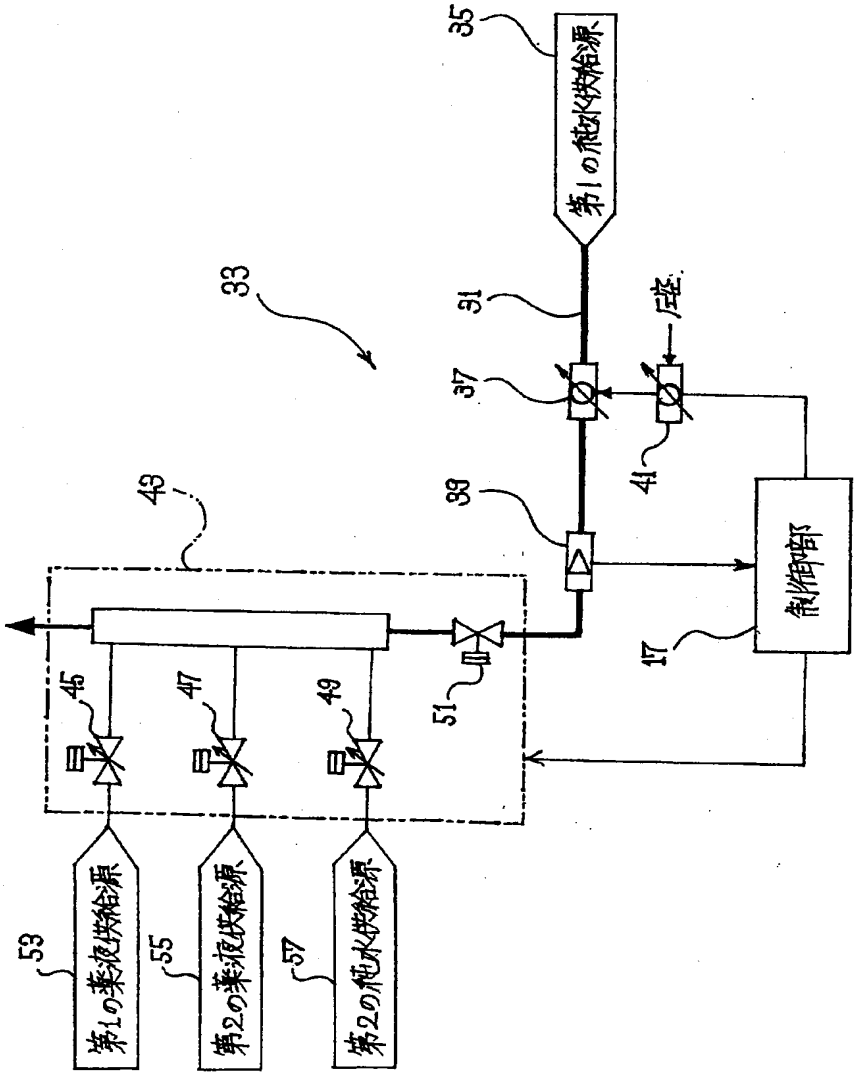
【図１】


気体供給源
21
19
11
9
W
17
5
33
供給機構
31
3
モータ
29
1
59
61
69
71
17
制御部
65
68
67
気体供給源
23
19
15
洗浄液供給源
25
27
純水供給源

【図２】

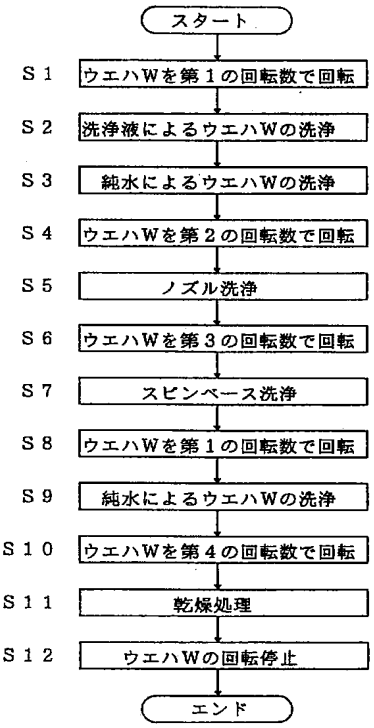
【書類名】　図面

【図２】


35
第1の純水供給源
33
51
37
圧空
41
39
43
制御部
17
45
47
49
51
53
第1の薬液供給源
55
第2の薬液供給源
57
第2の純水供給源

【図３】

【書類名】　図面
【図３】



フロントページの続き

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